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THE DISTRIBUTION OF ANIMALS.

A Text-Book of Zoogeography. By F. E. Beddard, M.A., F.R.S. Cambridge Natural Science Manuals. Pp. viii. and 246. (Cambridge: University Press, 1895.)

WITHIN the small limits of 246 duodecimo pages of fairly large type, it is scarcely possible to do justice to such an extensive subject as the geographical distribution of animals; and, bearing in mind the difficulties thus imposed upon him, we think the author of the volume before us is, on the whole, to be congratulated on the manner in which he has completed a very difficult task. He has given the student a large amount of very valuable information, and this in a pleasantly-written and easily-understood form. A writer who was not thoroughly at home in his subject might have contented himself with merely giving us abstracts of Mr. Wallace's works, with such corrections as are necessary in order to bring them up to date. Not so Mr. Beddard, who has introduced into his text-book a very large number of facts, chiefly relating to the lower vertebrates and invertebrates, which are not to be found in more pretentious works, and his volume will thus be of value to all students. As being one of the author's specialities, attention is strongly directed to the distribution of earth-worms; and the remarks concerning the curious relationship between the worms of Patagonia and those of Australia and New Zealand will be found specially interesting.

The general plan of the work is as follows. After defining locality and station, and pointing out the variability in the distributional areas of animals, the author takes a number of selected instances, drawn from very varied classes, of the distribution of particular groups. We have, for example, the range contrasted of such different animals as rheas, ibexes, gallinaceous birds, edentates, tortoises, batrachians, scorpions, planarians, and earth-worms. Having contrasted the differences presented by these groups, Mr. Beddard comes to the consideration of zoological regions; and here he concludes on the whole to adopt those of Messrs. Sclater and Wallace. "As a mere matter of convenience," he remarks, "it is immaterial whether we join Europe, Asia, and North America into one Holarctic region, or use the current terms of Nearctic and Palæarctic for the Old and New World divisions of this extensive tract." With all due deference, we submit that convenience has nothing whatever to do with the matter; and it is to be regretted that the author has not been bolder, and made a clean sweep of what is obsolete in our present system of zoological geography. He admits that mammals are, on the whole, the most satisfactory group on which to lay the foundations of the scheme; and yet he deliberately throws away Mr. Blanford's very excellent classification, in order to adopt one which obviously does not accord with the facts.

A want of boldness is, indeed, in our opinion, one of the most serious defects in the work, and we should have much liked to hear the author express, without reservation, his real opinions both as regards the so-called Antarctica, and also in respect to Dr. Baur's view that the Galapagos Islands are part of a sunken continent. We gather that, on the whole, Mr. Beddard appears to be indisposed to admit Antarctica in its entirety, but as to how much he believes in a southern land connection of more limited extent, it is almost impossible to discover. In this section of the work, moreover, the author has made two glaringly contradictory statements. Thus whereas on page 116, in treating of the limits of the Australian region, he remarks that "the boundary between it and the Oriental is sharply marked," we find him on page 106 hesitating whether Celebes should not be transferred from the former to the latter region. So much for sharp boundaries.

The third chapter deals with the causes influencing distribution; and here it may be noted that the author differs from Dr. C. H. Merriam,[1] in that he attributes a very minor part to the influence of temperature. Not improbably, however, the difference of opinion is largely due to the different environment of the two workers, the effects of this factor being apparently more noticeable in the New World than in the Old. Very many interesting instances bearing on the problem of dispersal will be found in this chapter. In the fourth chapter, the faunas of islands are discussed; while the fifth closes the work with a few theoretical considerations. In this chapter we find the remarkable suggestion that Marsupials have taken their origin in Australia; a conclusion which, in our opinion, has no shadow of justification from the facts of their past history, and which is absolutely contradicted by the author himself. After stating on page 226, that their "number in Europe may have been small," he speaks of these animals on page 227 as "once existing in great variety in Europe and North America," and later on in the same page that the "survivors have been pushed in to the furthest corner of the world—the Australian continent, and some of the islands to the north." More hopelessly contradictory statements it would be difficult to find. As to the author's conclusions that there has been a general migration of the older forms from north to south, we are in full accord.

It is much to be regretted, especially from the point of view of elementary students, that the work should be disfigured by several glaring inaccuracies which ought to have been corrected in proof. We find, for instance, the genus *Anurosorex* given as exclusively Palæarctic, whereas one of the two known species is from Assam. On the same page, again, the genus *Capra* is likewise given as confined to the Palæarctic region, whereas, on p. 22, the South Indian *C. hylocrius* is included in the same genus. Should Mr. O. Thomas ever read the work, he will be surprised to learn (p. 90) that he has identified the African pouched rats of the genus *Cricetomys* with the American *Hesperomys*. On p. 97 we have "musk-deer" in place of "musk-ox"; while on p. 100 we find the Siberian hippopotamus figuring as *Chœropotamus* (the name of an Eocene genus of pigs) instead of *Chœropsis*. Again, on p. 103, we have the langurs alluded to under the name of *Presbytes*, while on p. 106 they appear as *Semnopithecus*. By what confusion of ideas the name *Hyracodon* (which belongs to an extinct genus of rhinoceros-like animals) is made to do duty for *Didelphys*, we are at a loss to understand. Carelessness is likewise

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[1] See *Nat. Geogr. Mag.*, vol. vi. pp. 229-238 (1894).

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exhibited by the statement, on p. 111, that *Rhea* is exclusively confined to the Chilian sub-region of South America, especially after the author has stated on p. 20 that *Rhea macrorhyncha* occurs in Pernambuco and Bahia.

As likely to mislead the student, we must also call attention to the so-called genera *Aquias* and *Phyllotis* being placed among those characteristic of the Oriental region, whereas Dr. Dobson,[1] whose views are endorsed by Mr. Blanford, states that there is no justification for the separation of the forms thus named from the ordinary *Rhinolophus*. If the author has reason to doubt the correctness of such generally accepted views, he should have appended a note to that effect. Many other points of this nature might be alluded to; but we cannot help regretting that the author has once more resuscitated the myth of the fossil Australian elephant.

While the book would have been much better had more care been exercised on its composition and correction, it will serve a useful purpose as a general guide to the principles of the geographical distribution of animals, and may accordingly be recommended to the student, provided he have sufficient knowledge to steer clear of the pitfalls.

R. LYDEKKER.

ALKALI MANUFACTURE.

A Theoretical and Practical Treatise on the Manufacture of Sulphuric Acid and Alkali, with the Collateral Branches. By George Lunge, Ph.D., Professor of Technical Chemistry at the Federal Polytechnic School, Zurich. Second edition, vol. ii. Pp. xi. 929. (London: Gurney and Jackson, 1895.)

TO criticise, in the ordinary sense of the term, such a book as this, demands an experience as wide as that of the author—not only in the laboratory investigation and the exposition of the problems of chemical technology, but in the exigencies of daily life in a chemical works. This dual experience is possessed by few, and the present writer can lay no claim to it. But the wide acceptance of the first edition of Dr. Lunge's book as *the* work of reference on alkali manufacture, makes the expression of a judgment on its value superfluous, and the reviewer need do little more than make a general comparison between the present volume and its predecessor of fifteen years ago.

It may at once be said that the book has been thoroughly brought up to date. It is bulkier than the former edition to the extent of over 200 pages, though many processes described in detail in the earlier work, being now obsolete, or nearly so, are here merely referred to; but though some of this increased bulk arises from lengthy detailed accounts of new processes, yet most of it is due to the small additions interpolated on almost every page of the book. No published work on alkali manufacture appears to have escaped Dr. Lunge, whether in journal or patent literature; and he has not only furnished an admirable digest of the progress made in technological thought and practice since 1880, but has throughout given references to original sources.

One change in arrangement commends itself at once: the modes of occurrence and properties of raw materials and products are collected in the first chapter, while analytical methods are similarly gathered together in the second. A striking feature in the first chapter is the amount of space devoted to native soda. Recent explorations have greatly extended our knowledge of the occurrence of this substance, and with sources of supply like Owen's Lake in California, it seems not at all unlikely that in a few years native soda may compete on a large scale with that manufactured by the Leblanc and the ammonia processes. The chapter on analytical methods is very complete, the chief new feature in it being the description and illustration of Lunge and Marchlewski's gas analysis apparatus on p. 113. It seems a pity that those who buy and sell alkali should not by this time have reformed the chaotic condition of "trade customs" which makes it necessary still to devote five pages of a work like this to the question of alkalimetric "degrees."

In the chapter on the salt-cake process the changes consist chiefly in the greater prominence given to plus-pressure furnaces, of which two forms are figured, and to mechanical furnaces. At the date of the first edition, plus-pressure furnaces were in little more than an experimental stage; but the advantages they present have gradually made themselves felt, and their use has become correspondingly more frequent. The early type of the Jones mechanical furnace has been omitted from this edition, and mechanical furnaces are represented by the later form of the Jones furnace, with fixed stirrers and movable bottom, by the Mactear furnace, and by Larkin's mechanical roaster. These furnaces are all fully described and figured, and the discussion of their merits and demerits is eminently fair. The account of the Hargreaves process has been completely rewritten and greatly improved, entirely new drawings of the arrangement of the cylinders having been introduced. That this beautiful process should not have further extended, is matter for regret; but, as Dr. Lunge justly says, it came too late—it has had to succumb to the competition of the ammonia soda process, and the consequent necessary subordination of other considerations to the production, in the Leblanc process, of strong hydrochloric acid.

The condensation of hydrochloric acid had reached such a stage at the date of publication of the first edition, that we find but few changes in this one, and but two noticeable additions: an account and discussion of Dr. Hurter's mathematical treatment of condensation, and a description of the Lunge-Rohrmann plate-columns. The gist of Dr. Hurter's papers is, on the whole, very faithfully reproduced; but there are two errors which are likely to cause confusion to the reader unacquainted with the originals: on p. 308, lines 6 to 10, where the source of the figure 43·3 is not obvious, the fact being that it is quoted from a third example of Hurter's, in which the gas dealt with contains 43·3 per cent. of hydrochloric acid; and on p. 313, where, in converting Dr. Hurter's English measures into metric units, 20 cubic feet per second is taken as 20 feet per second, and the resulting contact figure is worked out to 324 instead of 3474. The Lunge towers are described in the body of the work, and details of their structure, as well as a summary of results obtained in their actual working at Duisburg, are given in the addenda. These figures are certainly remarkable testi-

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[1] "Cat. Chiroptera Brit. Mus.," p. 206.

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